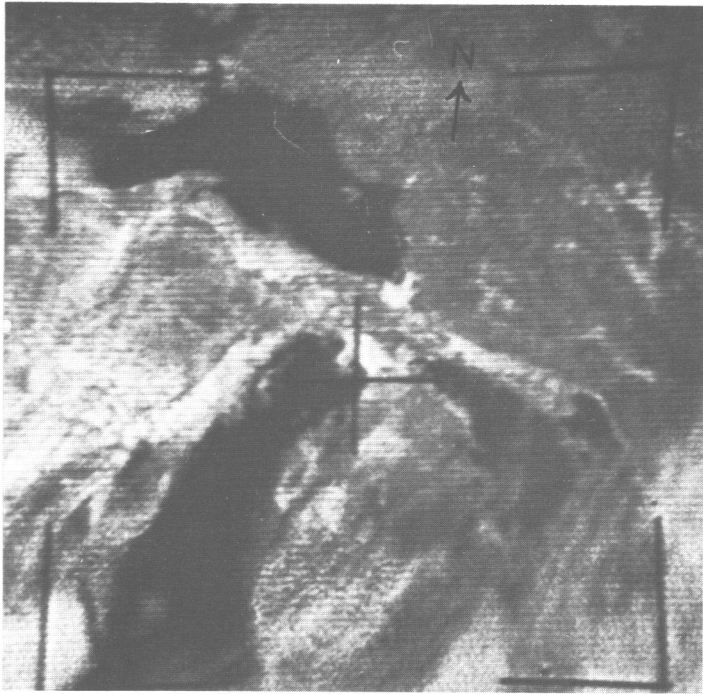
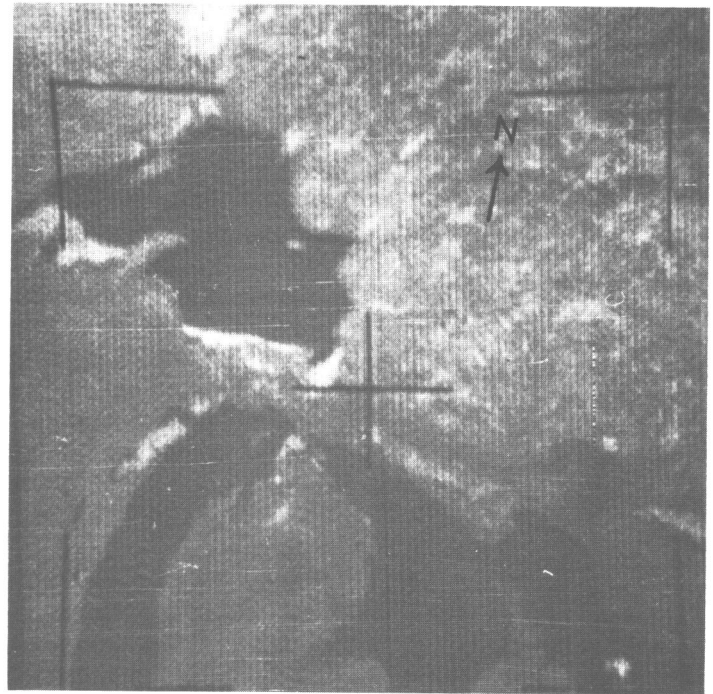


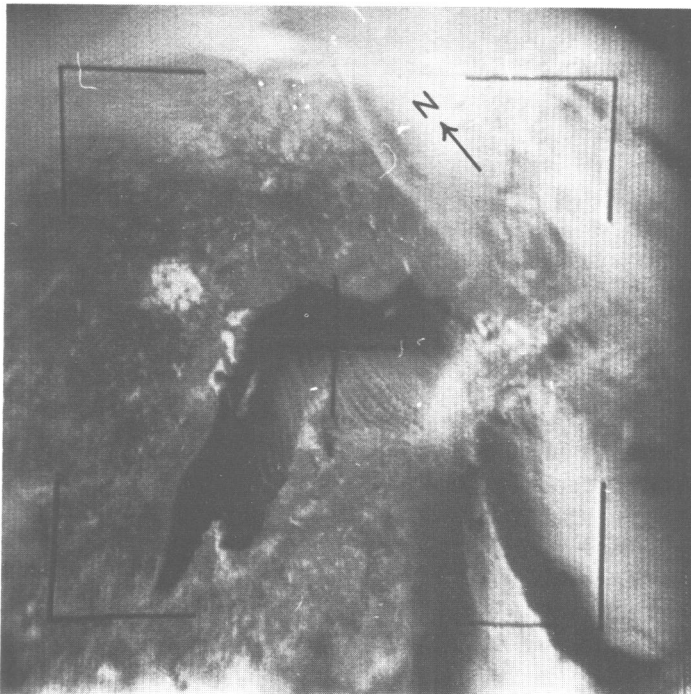
PICTURE OF THE MONTH



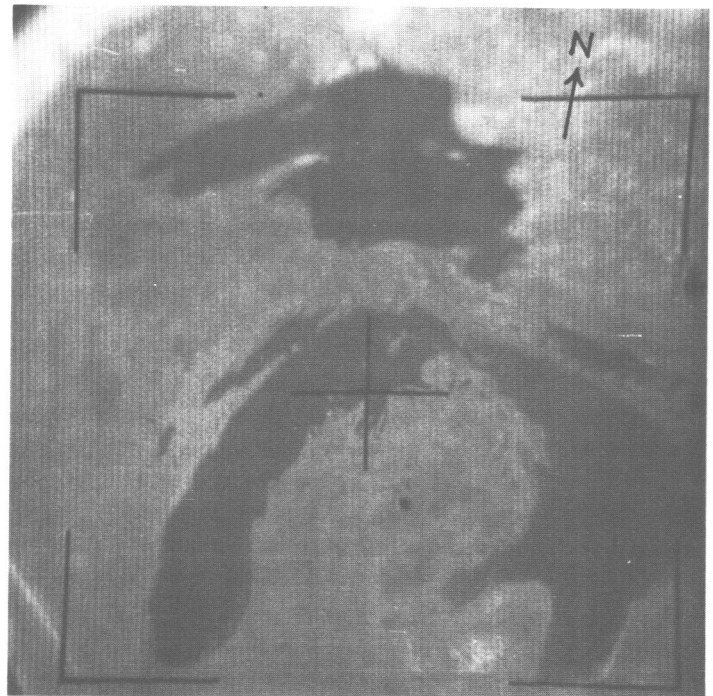
(a) TIROS IV, Pass 751-direct, Camera 2, frame 6, April 1, 1962.
2020 GMT.



(b) TIROS IV, Pass 1020-direct, Camera 2, frame 15, April 20,
1962, 1403 GMT.



(c) TIROS VIII, Pass 1094/1093 Camera 1, frame 26, March 5,
1964, 1933 GMT.



(d) TIROS VII, Pass 4602/4601, Camera 1, frame 23, April 25,
1964, 1551 GMT.

These photographs of the western Great Lakes Region were taken on different days during late winter and spring. (b) and (d) show the region under almost completely clear skies; (a) (c) contain considerable cloudiness but with much of the lakes still visible. Differences in shore

ice, snow cover, and land- and water-based convective clouds are apparent.

In (b) considerable ice is visible along the south shore of Lake Superior, with lesser amounts in bays along the north shore and in Green Bay (northwest of Lake Michi-

gan). Lake Nipigon and numerous smaller Canadian Lakes are covered with ice and snow. Forested snow-covered regions in Canada appear as an intermediate shade of gray. Photograph (a) reveals a similar and more extensive lake-ice distribution, less readily apparent because of co-existing land-based convective cloudiness. Multi-layered clouds exist toward the southeast corner of (a).

The greater amount of ice in (a) and (b), as compared with (c) and (d), probably reflected the colder 1962 winter in that area.

Water-based convective clouds are visible in (c), beginning near the center of Lake Superior and extending in narrow parallel rows to the south shore. At that time a deep cyclone (976 mb.) was centered over southwestern Quebec, just east of the pictured area, and Lake Superior lay beneath a northerly flow of very cold air (midday temperatures far below freezing). Wisconsin was largely cloud-free but with a heavy snow cover bordering the western shore of Lake Michigan. Dense clouds obscure Lower Michigan and the eastern shore of Lake Michigan.

CORRESPONDENCE

Comments on "Picture of the Month"

ROBE B. CARSON

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The photograph in the November 1965 contribution [5] to your excellent "Picture of the Month" series portrays a striking spiral vortex that fully warrants the space and attention given it. Indeed, I believe it is deserving of even more attention and thought than it has received.

Inasmuch as these cloud belts, which frequently contain violent convection, are of great importance to operational weather forecasting, an activity which more than any other supports and justifies the entire meteorological establishment, it behooves us as professionals to address ourselves with diligence to the important problem of establishing what these lines are. This means asking, and attempting to answer, the question of why these important convective lines often appear on our weather charts (when they appear at all) only as empirical addenda, running the gamut of confusion from "secondary cold fronts" through "cold fronts aloft," "pseudo cold fronts," "squall lines," "surge lines," "troughs aloft," "instability lines," and so on.

The two principal spiral bands have many common features. These include their logarithmic spiral shape, their form, their width, and their common termination. The visual evidence strongly suggests (though it does not necessarily prove) that these two singular curves are fundamentally the same kind of phenomenon: if they are not identical in nature, they must at least be identical in origin. In a word, they are homologous. The alternative to this conclusion would be to assume that two such similar shapes and forms happened by chance to result from widely divergent causes. Speaking euphemistically I believe we may say this is unlikely.

It was stated that the band entering from the east "corresponds" to an occluded front. If an occlusion was

carried on the weather map synoptic with this photograph, it would be a safe wager that it did not carry the shape of a logarithmic spiral, for few of them do. It was further noted that the second spiral band "does not correspond to any well defined feature on the surface or 500-mb. charts." We are, then, faced with the inference that one of these spirals is a front and the other is not. With this inference I disagree.

It was further suggested that the second band may be associated with a jet stream. The problem, in this case, is to produce a jet stream with a logarithmic spiral shape, something I have never seen.

Conclusions which seem to me logical from the photographic evidence only include the following: (1) We are looking at two spiral cloud bands. (2) They may or may not be fronts. (3) They may or may not be jet streams (i.e., caused thereby). (4) They may or may not be something else, say widgets. (5) If one is a widget, the other is probably a widget also. (6) If one is not a widget, the other is probably not a widget either.

The problem boils down to finding the essential homologies in these geographically diverse phenomena—the operationally important cloud belts that are found in all latitudes but which are popularly termed "fronts" in higher latitudes only. Those who have had occasion to use streamline analysis in operational weather forecasting know that theoretical lines of just such logarithmic spiral shape are a kinematic necessity in such analysis of any Low, tropical or otherwise, and also that pressure analysis is fundamentally incapable of delineating these singular lines, which Palmer et al. [3] called negative asymptotes and Sandström [4] called convergence lines. The term negative asymptote is to be preferred here since the lines may or may not be convergent. The negative asymptote, when convergent and when existing in low or middle levels and proximate to tropical air, frequently coincides with

(Continued on page 198)